

Fourth Quarter 2005 Groundwater Monitoring Report

**Former Fir Haven Shell
Miranda, California
Case No. 12748**

Prepared for:

Mr. Eugene Sky



Consulting Engineers & Geologists, Inc.

**812 W. Wabash Avenue
Eureka, CA 95501-2138
707/441-8855**

**February 2006
001032**



CONSULTING ENGINEERS & GEOLOGISTS, INC.

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Reference: 001032

February 28, 2006

Mr. Mark Verhey
Humboldt County Division of Environmental Health
100 H Street, Suite 100
Eureka, CA 95501

Subject: Groundwater Monitoring Report, Fourth Quarter 2005, Former Fir Haven Shell, Miranda, California; Case No. 12748

Dear Mr. Verhey:

This report presents the results of the fourth quarter 2005 groundwater monitoring for the Fir Haven Shell site, located at 5251 Highway 254 in Miranda, California. Site monitoring activities were conducted on November 2, 2005. SHN Consulting Engineers & Geologists, Inc. (SHN) performed this work on behalf of Mr. Eugene Sky.

If you have any questions, please call me at 707/441-8855.

Sincerely,

SHN Consulting Engineers & Geologists, Inc.

Erik J. Nielsen, P.G.
Project Manager

EJN:kas

Enclosure: Report

c. w/encl: Mr. Eugene Sky

Reference: 001032

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Prepared for:

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Prepared by:


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February 2006



QA/QC:EJN__

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Acronyms and Abbreviations

<	denotes a value that is "less than" the method detection limit
mV	millivolts
ppm	parts per million
ug/L	micrograms per Liter
BGS	Below Ground Surface
BTEX	Benzene, Toluene, Ethylbenzene, and total Xylenes
DCO ₂	Dissolved Carbon Dioxide
DO	Dissolved Oxygen
EC	Electrical Conductivity
EPA	U.S. Environmental Protection Agency
HCDEH	Humboldt County Division of Environmental Health
MTBE	Methyl Tertiary-Butyl Ether
MW-#	Monitoring Well-#
NA	Not Analyzed
ND	Not Detected
NS	Not Sampled
ORP	Oxidation-Reduction Potential
QA/QC	Quality Assurance/Quality Control
SHN	SHN Consulting Engineers & Geologists, Inc.
SP-#	Soil Sample-#
TPHG	Total Petroleum Hydrocarbons as Gasoline
UST	Underground Storage Tank
WP-#	Well Point-#

1.0 Introduction

This report presents the results of groundwater monitoring activities for the fourth quarter 2005, conducted at the former Fir Haven Shell (Case No. 12748). The site is located at 5251 Highway 254 in Miranda, California (Figure 1). SHN Consulting Engineers & Geologists, Inc. (SHN) conducted groundwater monitoring on November 2, 2005, as requested by the Humboldt County Division of Environmental Health (HCDEH).

1.1 Organization of the Report

This report is presented in five sections. This section introduces the reader to the site. Section 2.0 discusses the scope of work completed at the site during the fourth quarter 2005, monitoring event. Section 3.0 presents the results of the groundwater monitoring program. Section 4.0 presents a discussion regarding the nature of the site and future site activities. Section 5.0 presents a list of references cited.

1.2 Background

The subject site is the location of a former Shell service station (Figure 2). On March 29, 2001, two Underground Storage Tanks (USTs) previously used to store gasoline were abandoned in place under permit from HCDEH. During the UST abandonments, soil samples were collected from beneath the location of each tank to access the soil conditions. Petroleum constituents consisting of Total Petroleum Hydrocarbons as Gasoline (TPHG), Benzene, Toluene, Ethylbenzene, and total Xylenes (BTEX) were detected in soil samples collected from the site (SHN 2001).

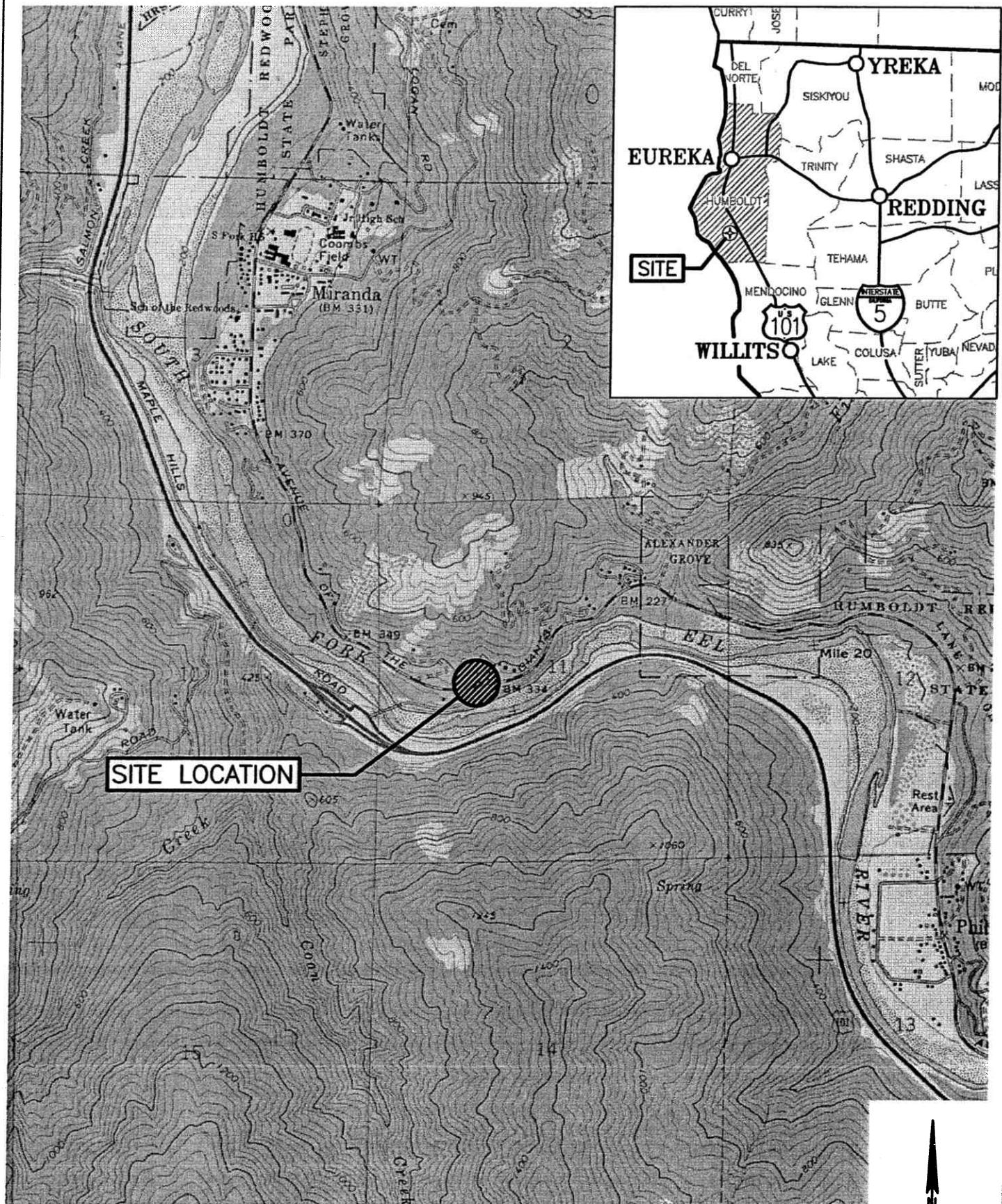
On November 24, 2003, a site investigation was completed to further define the vertical and lateral extent of petroleum hydrocarbon contamination at the site. Based on the results of this site investigation, it appeared that soil and groundwater in the area of the former USTs had been impacted with petroleum hydrocarbons (SHN 2004).

On November 12 and 13, 2004, four groundwater monitoring wells were installed at the site for the implementation of a site monitoring program (MW-1, MW-2, MW-3, and MW-4, in Figure 2). Groundwater samples collected from monitoring well MW-1 contained elevated concentrations of TPHG and BTEX. No detectable concentrations of petroleum constituents were present in the groundwater samples collected from other wells (SHN, January 2005). Groundwater monitoring at Former Fir Haven Shell site occurs on a quarterly basis, as requested by the HCDEH. Historic groundwater monitoring results are summarized in Appendix A.

2.0 Field Activities

2.1 Monitoring Well Sampling

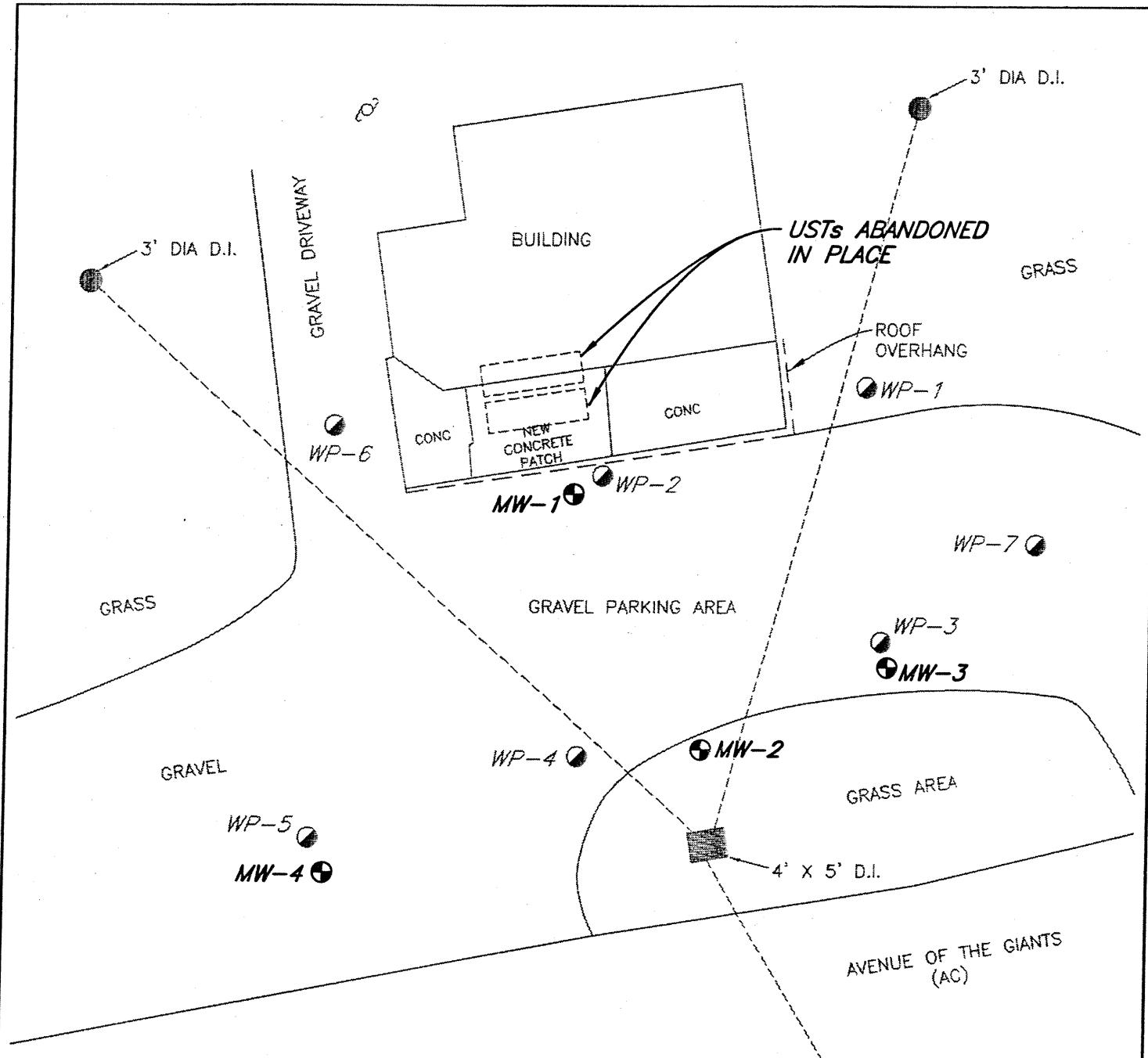
SHN conducted quarterly groundwater monitoring on November 2, 2005. As part of the monitoring program, wells MW-1, MW-2, and MW-4 were purged and sampled. Monitoring well MW-3 was not sampled due to insufficient recharge. Prior to commencing purging activities, all four monitoring wells were measured for depth to water and checked for the presence of floating



SOURCE: MIRANDA
USGS 7.5 MINUTE
QUADRANGLE

1" = 2000' ±

SH Consulting Engineers & Geologists, Inc.	Former Fir Haven Shell Miranda, California	Site Location Map SHN 001032
MAY 2005	001032-LOCATION	Figure 1



EXPLANATION

● BORING LOCATION AND DESIGNATION
WP-1 (SHN, NOVEMBER 2003)

● MONITORING WELL LOCATION AND
MW-1 DESIGNATION (SHN, NOVEMBER 2004)

NOTE: BORING LOCATIONS ARE APPROXIMATE



SHN Consulting Engineers & Geologists, Inc.	Former Fir Haven Shell Miranda, California	Site Plan SHN 001032
	DECEMBER 2004	001032-SI1-DEC-04

product (none was observed). Electrical Conductivity (EC), pH, and temperature were monitored periodically in site wells during purging activities using portable instrumentation. Each well was also monitored for Dissolved Oxygen (DO), Oxidation-Reduction Potential (ORP), and Dissolved Carbon Dioxide (DCO₂). DO and ORP were measured using portable instrumentation, and DCO₂ was measured using a field test kit. Each of the 7 wells was purged of at least 3 casing volumes prior to sampling. A groundwater sample was then collected from monitoring wells MW-1, MW-2, and MW-4 utilizing a disposable polyethylene bailer. The water samples were immediately placed in an ice-filled cooler, and submitted to the laboratory for analyses under appropriate chain-of-custody. Field notes and water sampling data sheets from the fourth quarter 2005, groundwater monitoring event are included in Appendix B.

2.2 Laboratory Analysis

Each groundwater sample was analyzed for the following:

- TPHG, in general accordance with U.S. Environmental Protection Agency (EPA) Method Nos. 5030/GCFID/8015B.
- BTEX and Methyl Tertiary-Butyl Ether (MTBE), in general accordance with EPA Method Nos. 5030/8021B.

North Coast Laboratories, Ltd., a State-certified analytical laboratory located in Arcata, California, conducted all analyses.

2.3 Equipment Decontamination Procedures

All monitoring and sampling equipment was cleaned prior to being transported to the former Fir Haven Shell site. All smaller equipment was initially washed in a water solution containing Liquinox® cleaner, followed by a distilled water rinse, then by a second distilled water rinse.

2.4 Investigation-Derived Waste Management

All rinse water utilized for decontaminating field sampling equipment and the well purge water was temporarily stored in 5-gallon buckets. The water was then transported to SHN's 1,000-gallon purge water storage tank located at 812 West Wabash Avenue in Eureka, California.

Approximately 28 gallons of decontamination and purge water from the November 2, 2005, groundwater monitoring event was discharged, under permit, to the City of Eureka municipal sewer system. A discharge receipt is included in Appendix A.

3.0 Groundwater Monitoring Results

3.1 Hydrology

SHN measured depth-to-groundwater in the existing groundwater monitoring wells on November 2, 2005. The results are summarized in Table 1.

Table 1 Groundwater Elevations, November 2, 2005 Former Fir Haven Shell, Miranda, California			
Sample Location	Top of Casing Elevation¹ (feet)	Depth to Water² (feet)	Groundwater Elevation (feet)
MW-1	339.23	19.07	320.16
MW-2	338.77	31.80	306.97
MW-3	339.02	28.89	310.13
MW-4	340.11	21.28	318.83

1. Referenced to North American Vertical Datum (NAVD) 88
2. Below top of casing

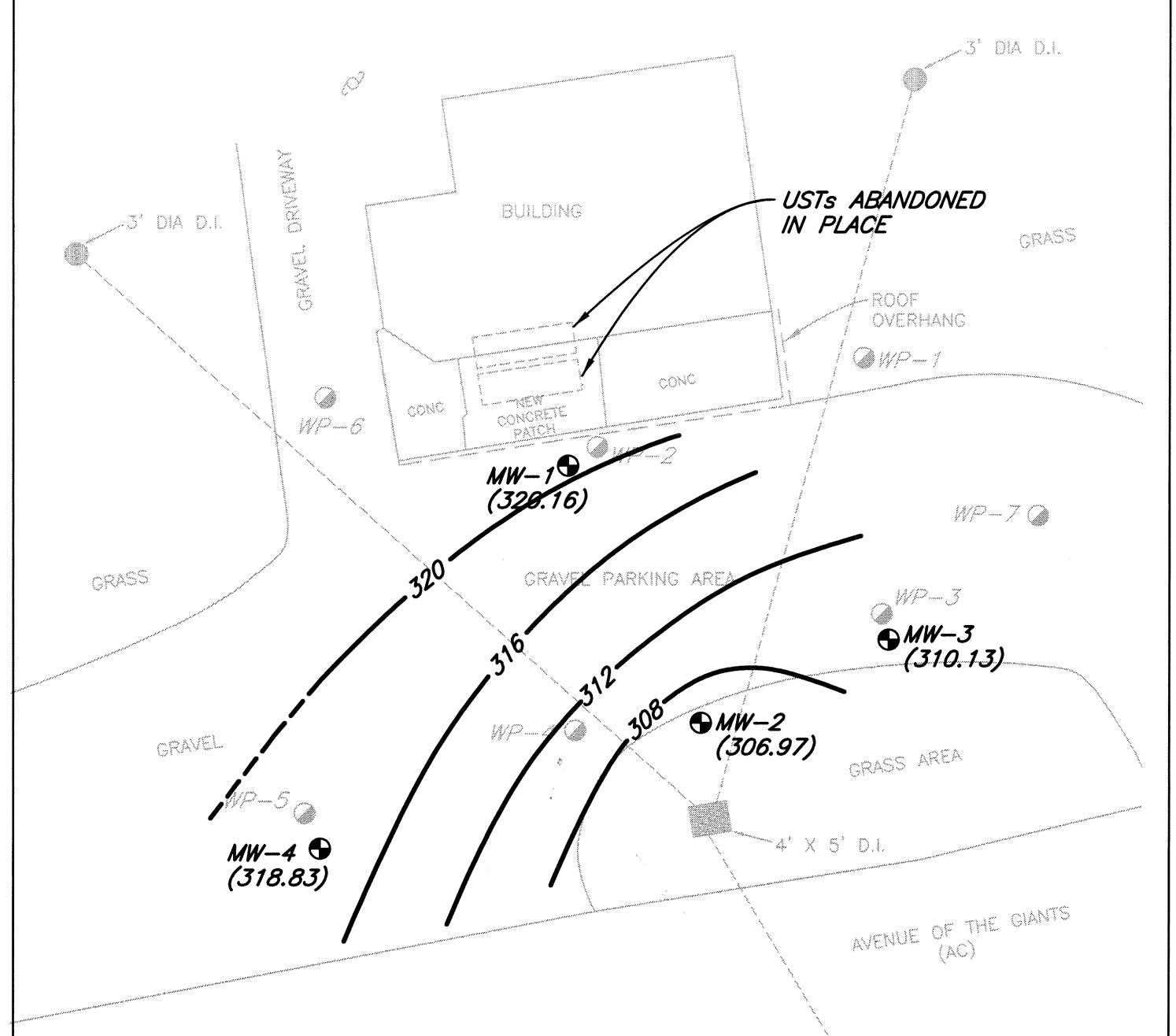
During this monitoring event, the direction of groundwater flow beneath the site was to the southeast, with an estimated gradient of 0.36. A groundwater contour map for the November 2, 2005, monitoring event is presented as Figure 3. Historic groundwater elevation data are presented in Appendix A, Table A-1.

3.2 Groundwater Analytical Results

The laboratory analytical results for the groundwater samples collected during the fourth quarter 2005, monitoring event are summarized in Table 2.

TPHG was detected in the groundwater sample collected from well MW-1 at a concentration of 46,000 micrograms per Liter (ug/L). Detectable concentrations of BTEX components were also present in this sample, including benzene at a concentration of 2,700 ug/L. The groundwater samples collected from wells MW-2 and MW-4 did not contain any detectable concentrations of either TPHG or BTEX. MTBE was not detected in any of the groundwater samples collected during the fourth quarter 2005, monitoring event. Monitoring well MW-3 was dry, after purging, on November 2, 2005, and as such, could not be sampled.

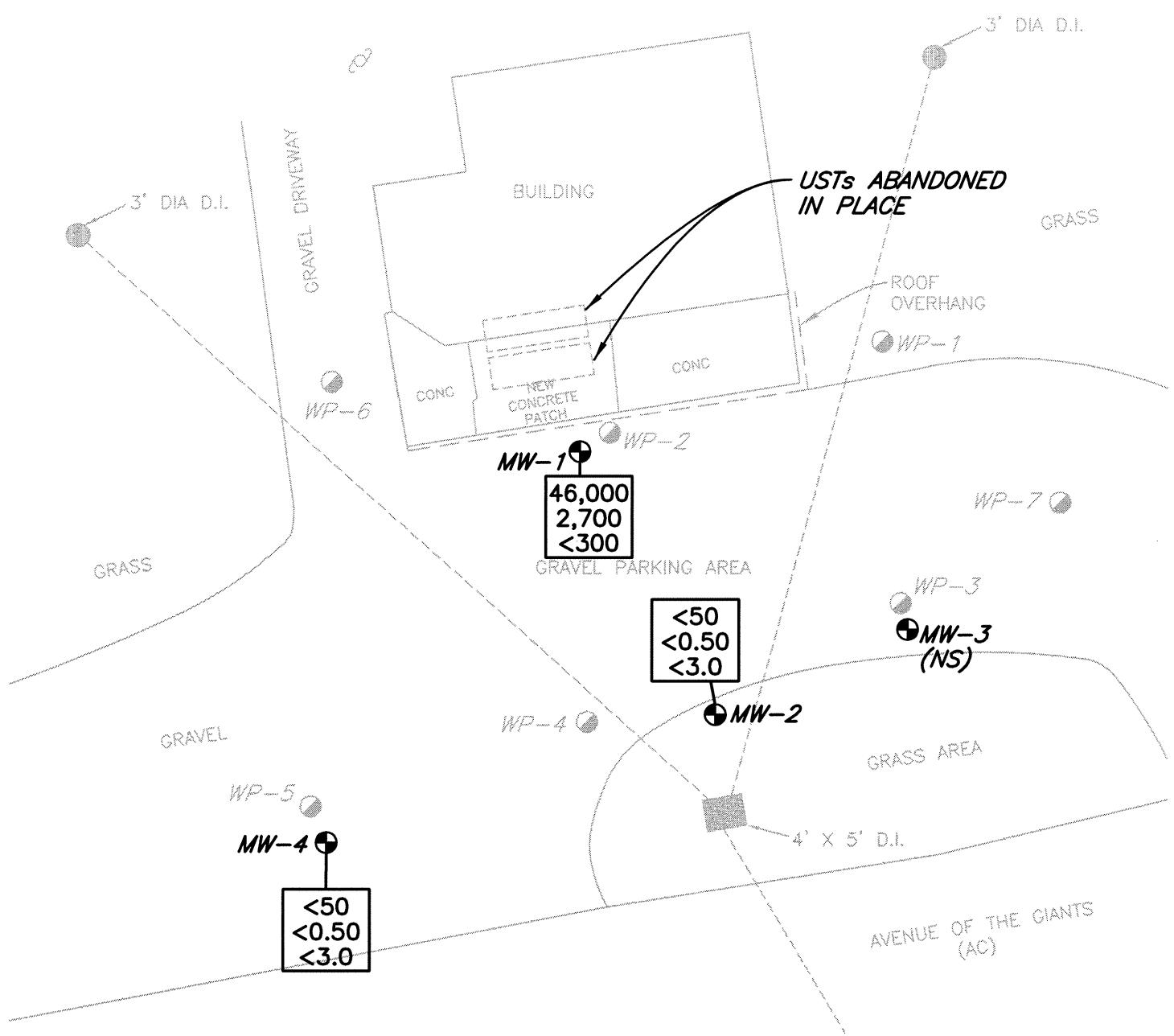
The concentrations of TPHG, benzene, and MTBE detected in groundwater on November 2, 2005, are shown on Figure 4. The complete laboratory test results, Quality Assurance/Quality Control (QA/QC) data, and chain-of-custody documentation are included in Appendix C. Historic groundwater monitoring data are presented in Appendix A, Table A-2.



EXPLANATION

- WP-1 SOIL BORING LOCATION AND DESIGNATION (SHN, NOVEMBER 2003)
- MW-1 MONITORING WELL LOCATION AND DESIGNATION (SHN, NOVEMBER 2004)
- (320.21) GROUNDWATER ELEVATION IN FEET (NAVD88)
- 311— GROUNDWATER CONTOUR IN FEET (NAVD88)

1"=20'



EXPLANATION

WP-1

SOIL BORING LOCATION AND DESIGNATION
(SHN, NOVEMBER 2003)

MW-1

MONITORING WELL LOCATION AND
DESIGNATION (SHN, NOVEMBER 2004)

<50
<0.50
<3.0

TPHG
BENZENE
MTBE

RESULTS IN ug/L

(NS)

NOT SAMPLED

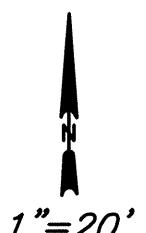


Table 2
Groundwater Analytical Results, November 2, 2005
Former Fir Haven Shell, Miranda, California
(in ug/L)¹

Sample Location	TPHG ²	Benzene ³	Toluene ³	Ethylbenzene ³	Total Xylenes ³	MTBE ³
MW-1	46,000⁴	2,700	4,800	1,400	7,800	<300 ^{5,6}
MW-2	<50	<0.50	<0.50	<0.50	<0.50	<3.0
MW-4	<50	<0.50	<0.50	<0.50	<0.50	<3.0

1. ug/L: micrograms per Liter
2. Total Petroleum Hydrocarbons as Gasoline (TPHG), analyzed in general accordance with U.S. Environmental Protection Agency (EPA) Method No. 5030/GCFID/8015B
3. Benzene, Toluene, Ethylbenzene, total Xylenes, and Methyl Tertiary-Butyl Ether (MTBE), analyzed in general accordance with EPA Method No. 5030/8021B
4. Sample appears to be similar to gasoline, but certain peak ratios are not that of a fresh gasoline standard. The reported result represents the amount of material in the gasoline range.
5. <: Denotes a value that is "less than" the laboratory method detection limit.
6. Reporting limit was raised due to matrix interference

3.3 Natural Attenuation Monitoring

Natural attenuation parameters DO, DCO₂, and ORP were measured in all four groundwater monitoring wells on November 2, 2005, prior to sampling, and are summarized in Table 3.

Table 3
DO, DCO₂, and ORP Measurement Results, November 2, 2005
Former Fir Haven Shell, Miranda, California

Sample Location	DO ¹ (ppm) ²	DCO ₂ ³ (ppm)	ORP ⁴ (mV) ⁵
MW-1	0.09	120	-132
MW-2	1.60	20	118
MW-3	0.50	40	148
MW-4	0.06	40	111

1. DO: Dissolved Oxygen, field measured using portable instrumentation
 2. ppm: parts per million
 3. DCO₂: Dissolved Carbon Dioxide, field measured using a field test kit
 4. ORP: Oxidation-Reduction Potential; field measurement using portable instrumentation
 5. mV: millivolts

During this monitoring event, DO concentrations ranged from 0.06 parts per million (ppm) in well MW-4, to 1.60 ppm in well MW-2. The DO concentrations in wells MW-2 and MW-3 appear to be sufficient to support biodegradation. DCO₂ concentrations ranged from 20 ppm in well MW-2, to 120 ppm in well

MW-1, and indicate that biodegradation may be occurring in the vicinity of MW-1. ORP measurements ranged from -132 millivolts (mV) in well MW-1, to 148 mV in well MW-3, and indicate that oxidizing conditions exist in site groundwater away from the source area and reducing conditions exist in the source area. Historic DO, DCO₂, and ORP measurements are presented in Appendix A, Table A-3.

4.0 Discussion and Recommendations

During the fourth quarter 2005, monitoring event, the groundwater sample collected from monitoring well MW-1 contained elevated concentrations of TPHG and BTEX components. The groundwater samples collected from wells MW-2 and MW-4 did not contain detectable concentrations of either TPHG or BTEX. MTBE was not detected in any of the groundwater samples that were collected during this monitoring event.

Based on the results of this and the previous four groundwater monitoring events, it does not appear that the petroleum hydrocarbon plume present in the source area is migrating. However, the continued elevated petroleum hydrocarbon constituents found in groundwater samples collected from well MW-1 indicate that significant petroleum hydrocarbon contamination is present in the source area.

As required by the HCDEH, SHN will continue quarterly groundwater monitoring at the site. The next groundwater monitoring event is scheduled for February 2006. SHN recommends the preparation of an additional site investigation workplan to further define the extent of petroleum hydrocarbon contamination near the source area.

5.0 References Cited

- SHN Consulting Engineers & Geologists, Inc. (June 19, 2001). "Site Investigation Work Plan, Former Fir Haven Shell, 5251 Highway 254, Miranda, California, HCDEH LOP No. 12748." Eureka: SHN.
- . (January 2004). *Well point Investigation Report of Findings, Former Fir Haven Shell, Miranda, California; Case No. 12748*. Eureka: SHN.
- . (January 2005). *Groundwater Monitoring Well Installation Report of Findings, Former Fir Haven Shell, Miranda, California; Case No. 12748*. Eureka: SHN.

Appendix A

Historic Data

Table A-1
Historic Groundwater Elevations
Former Fir Haven Shell, Miranda, California

Sample Location	Sample Date	Top of Casing Elevation (feet) ¹	Depth to Water ² (feet)	Groundwater Elevation (feet)
MW-1	11/20/04	339.23	19.95	319.28
	1/21/05		18.13	321.10
	5/11/05		17.73	321.50
	8/2/05		19.02	320.21
	11/2/05		19.07	320.16
MW-2	11/20/04	338.77	32.78	305.99
	1/21/05		29.55	309.22
	5/11/05		27.73	311.04
	8/2/05		32.70	306.07
	11/2/05		31.80	306.97
MW-3	11/20/04	339.02	DRY ³	--
	1/21/05		27.44	311.58
	5/11/05		26.70	312.32
	8/2/05		28.80	310.22
	11/2/05		28.89	310.13
MW-4	11/20/04	340.11	22.68	317.43
	1/21/05		18.09	322.02
	5/11/05		16.82	323.29
	8/2/05		19.15	320.96
	11/2/05		21.28	318.83

1. Referenced to North American Vertical Datum (NAVD) 88

2. Below top of casing

3. Well was dry on November 20, 2004. As such, a depth to water measurement could not be collected.

Table A-2
Historic Groundwater Monitoring Well Analytical Results
Former Fir Haven Shell, Miranda, California
(in ug/L)¹

Sample Location	Sample Date	TPHG ²	B ³	T ³	E ³	X ³	MTBE ³
MW-1	11/20/04	53,000 ⁴	4,300	5,900	1,600	8,600	<600 ^{5,6}
	1/21/05	26,000	3,200	2,500	870	3,900	<300 ⁶
	5/11/05	35,000 ⁴	2,800	4,000	980	5,200	<300 ⁶
	8/2/05	53,000 ⁴	3,100	6,500	1,500	8,500	<300 ⁶
	11/2/05	46,000	2,700	4,800	1,400	7,800	<300 ⁶
MW-2	11/20/04	<50	<0.50	<0.50	<0.50	<0.50	<3.0
	1/21/05	<50	<0.50	<0.50	<0.50	<0.50	<3.0
	5/11/05	<50	<0.50	<0.50	<0.50	<0.50	<3.0
	8/2/05	<50	<0.50	<0.50	<0.50	<0.50	<3.0
	11/2/05	<50	<0.50	<0.50	<0.50	<0.50	<3.0
MW-3	11/20/04	NS ⁷	NS	NS	NS	NS	NS
	1/21/05	<50	<0.50	<0.50	<0.50	<0.50	<3.0
	5/11/05	<50	<0.50	<0.50	<0.50	<0.50	<3.0
	8/2/05	NS	NS	NS	NS	NS	NS
	11/2/05	NS	NS	NS	NS	NS	NS
MW-4	11/20/04	<50	<0.50	<0.50	<0.50	<0.50	<3.0
	1/21/05	<50	<0.50	<0.50	<0.50	<0.50	<3.0
	5/11/05	<50	<0.50	<0.50	<0.50	<0.50	<3.0
	8/2/05	<50	<0.50	<0.50	<0.50	<0.50	<3.0
	11/2/05	<50	<0.50	<0.50	<0.50	<0.50	<3.0

1. ug/L: micrograms per Liter

2. TPHG: Total Petroleum Hydrocarbons as Gasoline, analyzed in general accordance with U.S. Environmental Protection Agency (EPA) Method Nos. 3510/GCFID/8015B or 5030/GCFID/8015B

3. Benzene (B), Toluene (T), Ethylbenzene (E), m,p-Xylene, o-Xylene, and Methyl Tertiary-Butyl Ether (MTBE), analyzed in general accordance with EPA Method Nos. 5030/8021B

4. Sample appears to be similar to gasoline, but certain peak ratios are not that of a fresh gasoline standard. The reported result represents the amount of material in the gasoline range.

5. <: Denotes a value that is "less than" the method detection limit.

6. Reporting limit raised due to matrix interference

7. NS: Not Sampled

Table A-3
Historic DO, DCO₂, and ORP Measurement Results
Former Fir Haven Shell, Miranda, California

Sample Location	Sample Date	DO ¹ (ppm) ²	DCO ₂ ³ (ppm)	ORP ⁴ (mV) ⁵
MW-1	1/21/05	2.09	180	-67
	5/11/05	0.05	150	-90
	8/2/05	1.15	120	-84
	11/2/05	0.09	120	-132
MW-2	1/21/05	4.96	30	93
	5/11/05	4.00	30	208
	8/2/05	1.77	20	128
	11/2/05	1.60	20	118
MW-3	1/21/05	5.26	60	116
	5/11/05	1.83	60	145
	8/2/05	2.95	60	135
	11/2/05	0.50	40	148
MW-4	1/21/05	2.04	40	104
	5/11/05	0.05	40	175
	8/2/05	1.26	40	131
	11/2/05	0.06	40	111

1. DO: Dissolved Oxygen, field measured using portable instrumentation

2. ppm: parts per million

3. DCO₂: Dissolved Carbon Dioxide, field measured using a field test kit

4. ORP: Oxidation-Reduction Potential; field measurement using portable instrumentation.

5. mV: millivolts

Appendix B
Field Notes



CONSULTING ENGINEERS & GEOLOGISTS, INC.

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DAILY FIELD REPORT

JOB NO		001032	
Page 1 of			
PROJECT NAME	DAILY FIELD REPORT SEQUENCE NO		
Former Firhaven Shell	1		
GENERAL LOCATION OF WORK	DATE		
Miranda, CA	11-2-05 DAY OF WEEK		
TYPE OF WORK	PROJECT ENGINEER/ SUPERVISOR		
Quarterly Sampling	Farris Lowman		
SOURCE & DESCRIPTION OF FILL MATERIAL	TECHNICIAN		
	David R. Paine		

DESCRIBE EQUIPMENT USED FOR HAULING, SPREADING, WATERING, CONDITIONING, & COMPACTING

- 0908 Arrived at site, removed lids and caps on all 4 wells, mw-3 had water in flush mount bailed out.
- 0939 I started taking water level readings deconing the seconder after each well by scrubbing it with trisodium then rinsing it with DI water.
- 1002 I started taking DO Readings.
- 1026 I started purging mw-3 with a disposable bailer, purge water was caught in a graduated 1.5 gal. bucket well went dry.
- 1042 I started purging mw-4 with a disposable bailer, purge water was caught in a graduated 3 gal. bucket.
- 1106 I started purging mw-2 with a disposable bailer, purge water was caught in a graduated 3 gal. bucket.
- 1206 I started purging mw-1 with a disposable bailer, purge water was caught in a graduated 3 gal. bucket.
- 1240 I sampled mw-4, secured well with cap and lid.
- 1250 I sampled mw-2, secured well with cap and lid.
- 1300 I sampled mw-1, secured well with cap and lid.
- 1310 OFF SITE

Note: All decon water and purge water was caught then poured into a 50 gal. plastic drum that I brought in the truck then transported to SHN's 1,000 gal. PWSI located at 812 W. Wabash Avenue Eureka, CA 28 gallons total.

COPY GIVEN TO:

REPORTED BY:

David R. Paine



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Groundwater Elevations



CONSULTING ENGINEERS & GEOLOGISTS, INC.

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EQUIPMENT CALIBRATION SHEET

Name: David R. Paine

Project Name: Former Fishhaven Shell

Reference No.: 001032

Date: 11-2-05

Equipment: pH & EC PID GTCO₂ GTLEL
 Turbidity Other Dissolved Oxygen Meter YS195

Description of Calibration Procedure and Results:

pH & EC meter is calibrated using a 2 buffer method with 7.01 and 4.01, the EC (conductivity) is set at 1413 uS.

DO meter is self calibrating with the Altimeter set at 3.



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Water Sampling Data Sheet

Project Name:	Former Fir Haven Shell	Date/Time:	11-2-05
Project No.:	001033	Sampler Name:	David R. Paine
Location:	Miranda, CA	Sample Type:	Ground water
Well #:	MW-1	Weather	Partially cloudy
Hydrocarbon Thickness/Depth (feet):	NA	Key Needed:	YES Dolphin

$$\begin{array}{l} \text{Total Well Depth} \quad \text{Initial Depth to} \quad = \quad \text{Height of Water} \\ \text{(feet)} \quad \text{Water (feet)} \quad \quad \quad \text{Column (feet)} \quad \times \quad \begin{array}{l} 0.163 \text{ gal/ft (2-inch well) /} \\ 0.653 \text{ gal/ft (4-inch well)} \end{array} = \quad \begin{array}{l} 1 \text{ Casing Volume} \\ (\text{gal}) \end{array} \\ \boxed{30.05} \quad - \quad \boxed{19.07} \quad = \quad \boxed{10.98} \quad \times \quad \boxed{0.163} \quad = \quad \boxed{1.79} \end{array}$$

Time	DO (ppm)	CO ₂ (ppm)	ORP (mV)	EC (uS/cm)	Temp (°F)	pH	Water Removed (gal)	Comments
1015	0.09						0 gal.	
1206		1.20	-132				0.25 gal.	
1219				425	60°	6.57	2 gal.	
1224	No Flow			436	60.1°	6.60	3.50 gal.	
1230	Han cell			439	59.4°	6.62	5.50 gal.	
1300	Sample Time							

Purge Method: Hand Bail

Total Volume Removed: 5.50 (gal)

Laboratory Information

Sample ID	# & Type of Containers	Preservative / Type	Laboratory	Analyses
MW-1	3 - 40ml vials	YES HCL	NCL	TPHg / BTEX / mTBE

Well Condition: Good

Remarks: purge water has an odor

Recharged to 23.41 at sample time



Water Sampling Data Sheet

Project Name:	<u>Former Fir Haven Sh. II</u>	Date/Time:	<u>11-2-05</u>
Project No.:	<u>001032</u>	Sampler Name:	<u>David R. Paine</u>
Location:	<u>Miranda, CA</u>	Sample Type:	<u>Ground water</u>
Well #:	<u>MW-2</u>	Weather	<u>Partially cloudy</u>
Hydrocarbon Thickness/Depth (feet):	<u>NA</u>	Key Needed:	<u>YES</u> <u>Dolphin</u>

$$\begin{array}{l} \text{Total Well Depth} - \text{Initial Depth to Water (feet)} = \text{Height of Water Column (feet)} \times 0.163 \text{ gal/ft (2-inch well) /} \\ \boxed{50.17} - \boxed{31.80} = \boxed{18.37} \times \boxed{0.163} = \boxed{2.99} \quad 0.653 \text{ gal/ft (4-inch well)} \end{array} \quad 1 \text{ Casing Volume (gal)}$$

Time	DO (ppm)	CO ₂ (ppm)	ORP (mV)	EC (uS/cm)	Temp (°F)	pH	Water Removed (gal)	Comments
1011	1.60						0 gal	
1106		20	118				0.25 gal	
1120	↓			218	61.2°	6.59	3 gal.	
1129	No Flow			245	61.2°	6.68	6 gal.	
1139	Han cell			264	61.2°	6.76	9 gal.	
1147				283	60.6°	6.78	12 gal.	
1157				303	60.5°	6.86	15 gal.	
1250	Sample Time							

Purge Method: Hand BailTotal Volume Removed: 15.00 (gal)

Laboratory Information

Sample ID	# & Type of Containers	Preservative / Type	Laboratory	Analyses
MW-2	3-40ml vials	YES HCL	NCL	TPHg / BTEX / mTBE

Well Condition: Good

Remarks:

Recharged to 36.08 at sample time



CONSULTING ENGINEERS & GEOLOGISTS, INC.

812 W. Wabash • Eureka, CA 95501-2138 • 707/441-8855 • FAX: 707/441-8877 • shninfo@shn-engr.com

Water Sampling Data Sheet

Project Name:	Fernier Fir Haven Sh II	Date/Time:	11-2-05
Project No.:	001038	Sampler Name:	David R. Parra
Location:	Miranda, CA	Sample Type:	Ground water
Well #:	MW-3	Weather	Partially cloudy
Hydrocarbon Thickness/Depth (feet):	NA	Key Needed:	YES Dolphin

$$\begin{array}{l} \text{Total Well Depth} \quad \text{Initial Depth to} \\ (\text{feet}) \quad \text{Water (feet)} \quad = \quad \text{Height of Water} \\ \boxed{29.35} \quad - \quad \boxed{28.89} \quad = \quad \boxed{0.46} \end{array} \times \begin{array}{l} 0.163 \text{ gal/ft (2-inch well) /} \\ 0.653 \text{ gal/ft (4-inch well) } \end{array} = \begin{array}{l} 1 \text{ Casing Volume} \\ (\text{gal}) \end{array} \quad \boxed{0.163} \quad = \quad \boxed{0.07}$$

Time	DO (ppm)	CO ₂ (ppm)	ORP (mV)	EC (uS/cm)	Temp (°F)	pH	Water Removed (gal)	Comments
1003	0.50						0 gal	
1026		40	148				0.03 gal	
1036	↓			560	62.5°	6.70	0.06 gal. Dry	
1201	No Flow	No Recharge					0.06 gal. Dry	
	then cell							
—	Sample Time							

Purge Method: Hand Bail

Total Volume Removed: 0.06 (gal)

Laboratory Information

Sample ID	# & Type of Containers	Preservative / Type	Laboratory	Analyses
████████	████████	██████	████	████████████████

Well Condition: Good

Remarks: No sample, no recharge
Recharged to at sample time



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Water Sampling Data Sheet

Project Name: Former Fir Haven Shell Date/Time: 11-2-05
Project No.: 001038 Sampler Name: David R. Paine
Location: Miranda, CA Sample Type: Ground water
Well #: MW-4 Weather: Partially cloudy
Hydrocarbon Thickness/Depth (feet): NA Key Needed: YES Dolphin

$$\text{Total Well Depth (feet)} - \text{Initial Depth to Water (feet)} = \text{Height of Water Column (feet)} \times \frac{0.163 \text{ gal/ft (2-inch well)}}{0.653 \text{ gal/ft (4-inch well)}} = \text{1 Casing Volume (gal)}$$

29.32	-	21.28	=	8.04	\times	0.163	=	1.31
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Purge Method: Hand Bail

Total Volume Removed: 4.00 (gal)

Laboratory Information

Sample ID	# & Type of Containers	Preservative / Type	Laboratory	Analyses
MW-4	3 - 40ml vials	YES HCL	NCL	TPHg / BTEX / mTBE

Well Condition: Good

Remarks:

Recharged to 23.47 at sample time

Client Name:

FORMER FIR HAVEN SHELL

The water from your site:

5251 Highway 254, Miranda, CA

LOP #12748

SHN ref #

001032

Collected On: **11/2/2005**

Has been tested and certified as acceptable to be discharged into the City of Eureka municipal sewer system.

Amount Discharged:

28 GALLONS

Date Discharged:

12/19/05

Certified by:

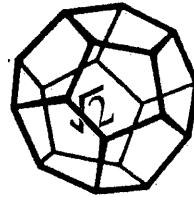
AARON MELODY

SHN CONSULTING ENGINEERS & GEOLOGISTS, INC.

City of Eureka Wastewater Discharge Permit #65

Appendix C

Laboratory Analytical Report



**NORTH COAST
LABORATORIES LTD.**

November 15, 2005

SHN Consulting Engineers and Geologists
812 West Wabash Avenue
Eureka, CA 95501

Attn: Frans Lowman

RE: 001032, Former Firhaven Shell

Order No.: 0511040
Invoice No.: 54301
PO No.:
ELAP No. 1247-Expires July 2006

SAMPLE IDENTIFICATION

Fraction Client Sample Description

01A	MW-4
02A	MW-2
03A	MW-1

ND = Not Detected at the Reporting Limit

Limit = Reporting Limit

All solid results are expressed on a wet-weight basis unless otherwise noted.

REPORT CERTIFIED BY

Laboratory Supervisor(s)

QA Unit

Jesse G. Chaney, Jr.
Laboratory Director

CLIENT: SHN Consulting Engineers and Geologists
Project: 001032, Former Firhaven Shell
Lab Order: 0511040

CASE NARRATIVE

TPH as Gasoline:

Sample MW-1 appears to be similar to gasoline but certain peak ratios are not that of a fresh gasoline standard. The reported result represents the amount of material in the gasoline range.

BTEX:

Sample MW-1 was reported as ND with a dilution due to matrix interference.

Date: 15-Nov-05
WorkOrder: 0511040

ANALYTICAL REPORT

Client Sample ID: MW-4
Lab ID: 0511040-01A

Received: 11/3/05

Collected: 11/2/05 12:40

Test Name: BTEX

Reference: EPA 5030/EPA 8021B

Parameter	Result	Limit	Units	DF	Extracted	Analyzed
MTBE	ND	3.0	µg/L	1.0		11/10/05
Benzene	ND	0.50	µg/L	1.0		11/10/05
Toluene	ND	0.50	µg/L	1.0		11/10/05
Ethylbenzene	ND	0.50	µg/L	1.0		11/10/05
m,p-Xylene	ND	0.50	µg/L	1.0		11/10/05
o-Xylene	ND	0.50	µg/L	1.0		11/10/05
Surrogate: Cis-1,2-Dichloroethylene	87.7	85-115	% Rec	1.0		11/10/05

Test Name: TPH as Gasoline

Reference: EPA 5030/GCFID(LUFT)/EPA 8015B

Parameter	Result	Limit	Units	DF	Extracted	Analyzed
TPHC Gas (C6-C14)	ND	50	µg/L	1.0		11/10/05

Client Sample ID: MW-2

Received: 11/3/05

Collected: 11/2/05 12:50

Lab ID: 0511040-02A

Test Name: BTEX

Reference: EPA 5030/EPA 8021B

Parameter	Result	Limit	Units	DF	Extracted	Analyzed
MTBE	ND	3.0	µg/L	1.0		11/10/05
Benzene	ND	0.50	µg/L	1.0		11/10/05
Toluene	ND	0.50	µg/L	1.0		11/10/05
Ethylbenzene	ND	0.50	µg/L	1.0		11/10/05
m,p-Xylene	ND	0.50	µg/L	1.0		11/10/05
o-Xylene	ND	0.50	µg/L	1.0		11/10/05
Surrogate: Cis-1,2-Dichloroethylene	90.0	85-115	% Rec	1.0		11/10/05

Test Name: TPH as Gasoline

Reference: EPA 5030/GCFID(LUFT)/EPA 8015B

Parameter	Result	Limit	Units	DF	Extracted	Analyzed
TPHC Gas (C6-C14)	ND	50	µg/L	1.0		11/10/05

Date: 15-Nov-05
WorkOrder: 0511040

ANALYTICAL REPORT

Client Sample ID: MW-1
Lab ID: 0511040-03A

Received: 11/3/05

Collected: 11/2/05 13:00

Test Name: BTEX

Reference: EPA 5030/EPA 8021B

<u>Parameter</u>	<u>Result</u>	<u>Limit</u>	<u>Units</u>	<u>DF</u>	<u>Extracted</u>	<u>Analyzed</u>
MTBE	ND	300	µg/L	100		11/10/05
Benzene	2,700	500	µg/L	1,000		11/10/05
Toluene	4,800	500	µg/L	1,000		11/10/05
Ethylbenzene	1,400	500	µg/L	1,000		11/10/05
m,p-Xylene	5,500	500	µg/L	1,000		11/10/05
o-Xylene	2,300	500	µg/L	1,000		11/10/05
Surrogate: Cis-1,2-Dichloroethylene	106	85-115	% Rec	100		11/10/05

Test Name: TPH as Gasoline

Reference: EPA 5030/GCFID(LUFT)/EPA 8015B

<u>Parameter</u>	<u>Result</u>	<u>Limit</u>	<u>Units</u>	<u>DF</u>	<u>Extracted</u>	<u>Analyzed</u>
TPHC Gas (C6-C14)	46,000	5,000	µg/L	100		11/10/05

North Coast Laboratories, Ltd.

Date: 15-Nov-05

CLIENT: SHN Consulting Engineers and Geologists
Work Order: 0511040
Project: 001032, Former Firthaven Shell

QC SUMMARY REPORT
Method Blank

Sample ID: MB-11/10/05	Batch ID: R37982	Test Code: BTXEW	Units: µg/L	Analysis Date: 11/10/05 4:42:20 PM			Prep Date:				
Client ID:		Run ID: ORGCB_051110B		SeqNo:	546741						
Analyte	Result	Limit	SPK value	SPK Ref Val	% Rec	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
MTBE	ND	3.0									
Benzene	ND	0.50									J
Toluene	0.1587	0.50									
Ethylbenzene	ND	0.50									J
m,p-Xylene	0.2410	0.50									
o-Xylene	ND	0.50									
Cis-1,2-Dichloroethylene	0.930	0.10	1.00	0	93.0%	85	115	0			
Sample ID: MB-11/10/05	Batch ID: R37981	Test Code: TPHC GW	Units: µg/L	Analysis Date: 11/10/05 4:42:20 PM			Prep Date:				
Client ID:		Run ID: ORGCB_051110A		SeqNo:	546725						
Analyte	Result	Limit	SPK value	SPK Ref Val	% Rec	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
TPHC Gas (C6-C14)	ND	50									

Qualifiers:
ND - Not Detected at the Reporting Limit
J - Analyte detected below quantitation limits

S - Spike Recovery outside accepted recovery limits
R - RPD outside accepted recovery limits

B - Analyte detected in the associated Method Blank

North Coast Laboratories, Ltd.

Date: 15-Nov-05

CLIENT: SHN Consulting Engineers and Geologists**Work Order:** 0511040**Project:** 001032, Former Firhaven Shell
QC SUMMARY REPORT
 Laboratory Control Spike

Sample ID: LCS-05716	Batch ID: R37982	Test Code: BTXEW	Units: µg/L				Analysis Date: 11/10/05 1:43:50 PM	Prep Date: 546739						
Client ID:		Run ID: ORGCB_051110B		Result	Limit	SPK value	SPK Ref Val	% Rec	LowLimit	HighLimit	RPD Ref Val	% RPD	RPD Limit	Qual
MTBE	39.89	3.0	40.0	0	99.7%	85	115	0						
Benzene	4.799	0.50	5.00	0	96.0%	85	115	0						
Toluene	4.890	0.50	5.00	0	97.8%	85	115	0						
Ethylbenzene	4.692	0.50	5.00	0	93.8%	85	115	0						
m,p-Xylene	9.398	0.50	10.0	0	94.0%	85	115	0						
o-Xylene	4.780	0.50	5.00	0	95.6%	85	115	0						
Cis-1,2-Dichloroethylene	1.08	0.10	1.00	0	108%	85	115	0						
Sample ID: LCSD-05716	Batch ID: R37982	Test Code: BTXEW	Units: µg/L				Analysis Date: 11/10/05 10:32:28 PM	Prep Date: 546750						
Client ID:		Run ID: ORGCB_051110B		Result	Limit	SPK value	SPK Ref Val	% Rec	LowLimit	HighLimit	RPD Ref Val	% RPD	RPD Limit	Qual
MTBE	35.91	3.0	40.0	0	89.8%	85	115	0						
Benzene	4.594	0.50	5.00	0	91.9%	85	115	4.80	4.35%	15				
Toluene	4.635	0.50	5.00	0	92.7%	85	115	4.89	5.39%	15				
Ethylbenzene	4.498	0.50	5.00	0	90.0%	85	115	4.69	4.23%	15				
m,p-Xylene	9.037	0.50	10.0	0	90.4%	85	115	9.40	3.92%	15				
o-Xylene	4.588	0.50	5.00	0	91.8%	85	115	4.78	4.10%	15				
Cis-1,2-Dichloroethylene	0.970	0.10	1.00	0	97.0%	85	115	1.08	10.7%	15				
Sample ID: LCS-05717	Batch ID: R37981	Test Code: TPHCGW	Units: µg/L				Analysis Date: 11/10/05 2:55:34 PM	Prep Date: 546723						
Client ID:		Run ID: ORGCB_051110A		Result	Limit	SPK value	SPK Ref Val	% Rec	LowLimit	HighLimit	RPD Ref Val	% RPD	RPD Limit	Qual
TPHC Gas (C6-C14)	455.3	50	500	0	91.1%	85	115	0						

Qualifiers:ND - Not Detected at the Reporting Limit
J - Analyte detected below quantitation limitsS - Spike Recovery outside accepted recovery limits
R - RPD outside accepted recovery limits

B - Analyte detected in the associated Method Blank

CLIENT: SHN Consulting Engineers and Geologists
Work Order: 0511040
Project: 001032, Former Firhaven Shell

QC SUMMARY REPORT
Laboratory Control Spike Duplicate

Sample ID: LCSID-05717	Batch ID: R37981	Test Code: TPHCGW	Units: µg/L	Analysis Date: 11/10/05 11:07:19 PM			Prep Date:				
Client ID:		Run ID:	ORGCS_051110A	SeqNo:	546733						
Analyte	Result	Limit	SPK value	SPK Ref Val	% Rec	LowLimit	HighLimit	RPD Ref Val	%RPD	RPD Limit	Qual
TPHC Gas (C6-C14)	435.3	50	500	0	87.1%	85	115	455	4.50%	15	

Qualifiers:

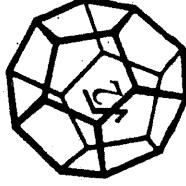
ND - Not Detected at the Reporting Limit

J - Analyte detected below quantitation limits

S - Spike Recovery outside accepted recovery limits

B - Analyte detected in the associated Method Blank

R - RPD outside accepted recovery limits



**NORTH COAST
LABORATORIES LTD.**

55680 West End Road • Arcata • CA 95521-9202
707-822-4649 Fax 707-822-6831

Chain of Custody

55680 West End Road • Arcata • CA 95521-9202
707.822.4545 707.822.5555

Attention:	<u>Fran</u>	<u>Lowman</u>
Results & Invoice to:	<u>SHN</u>	
Address:	<u>812 West Wabash Avenue</u>	
	<u>Eureka, CA 95501</u>	
Phone:	<u>441-8855</u>	
Copies of Report to:		
Sampler (Sign & Print):	<u>Dan J.P. Low David P. Low</u>	
PROJECT INFORMATION		
Project Number:	<u>001032</u>	
Project Name:	<u>Farmers Firehouse Shell</u>	
Purchase Order Number:		

LABORATORY NUMBER:			
TAT: <input type="checkbox"/> 24 Hr <input type="checkbox"/> 48 Hr <input type="checkbox"/> 5 Day <input type="checkbox"/> 5-7 Day	STD (2-3 Wk) <input type="checkbox"/> Other: _____		
PRIOR AUTHORIZATION IS REQUIRED FOR RUSHES			
REPORTING REQUIREMENTS:	State Forms <input type="checkbox"/>		
Preliminary: FAX <input type="checkbox"/> Verbal <input type="checkbox"/> By: _____/_____- Final Report: FAX <input type="checkbox"/> Verbal <input type="checkbox"/> By: _____/_____-			
CONTAINER CODES: 1—1/2 gal. pt; 2—250 ml pt; 3—500 ml pt; 4—1 L Nalgene; 5—250 ml BG; 6—500 ml BG; 7—1 L BG; 8—1 L CG; 9—40 ml VOA; 10—125 ml VOA; 11—4 oz glass jar; 12—8 oz glass jar; 13—brass tube; 14—other			
PRESERVATIVE CODES: a—HNO ₃ ; b—HCl; c—H ₂ SO ₄ ; d—Na ₂ S ₂ O ₃ ; e—NaOH; f—C ₂ H ₃ O ₂ Cl; g—other			
SAMPLE CONDITION/SPECIAL INSTRUCTIONS <i>EDF</i> <i>Global ID# T060239110</i>			
SAMPLE DISPOSAL <input checked="" type="checkbox"/> NCL Disposal of Non-Contaminated <input type="checkbox"/> Return			
CHAIN OF CUSTODY SEALS Y/N/NA <input checked="" type="checkbox"/> UPS <input type="checkbox"/> Air-Ex <input type="checkbox"/> Fed-Ex <input type="checkbox"/> Bus <input type="checkbox"/> Hand			

***MATRIX:** DW=Drinking Water; Eff=Effluent; Inf=Influent; SW=Surface Water; S=Soil; O=Other.